

AMENDMENTS TO THE CLAIMS

1-43. (Canceled)

44. (Currently Amended) A method, in a contact center comprising a central server for distributing work items to workstations of a first set of resources, and a work queue having a plurality of work items, the method comprising:

receiving the plurality of work items at at least one telecommunications component of the contact center from a plurality of customers, wherein the at least one telecommunications component comprises at least one of a PBX and a server;

generating, in a server executing a workload monitoring agent, based at least in part on said work queue, an ordered set of items related to the plurality of work items in the work queue;

analyzing, by said server executing the workload monitoring agent, said ordered set, wherein the analyzing step determines a required queue position for each of the plurality of work items, wherein at least one of the following is true for a selected required queue position;

(i) multiple of the work items have a determined required queue position equal to the selected required queue position; and

(ii) no work items have a determined required queue position equal to the selected required queue position and wherein the selected required queue position is closer to a head of the ordered set than another selected required queue position that equals a determined required queue position of at least one of the work items;  
based on said analyzing step, determining in said server executing the workload monitoring agent a state of said work queue;

forwarding work items in the work queue to workstations of the first set of resources; and  
when the workload monitoring agent predicts a surplus of work items, additionally forwarding work items to workstations of a second set of resources.

45. (Previously Presented) The method of claim 44, wherein the workstations of the first set of resources service the work items forwarded thereto and the workstations of the second set of resources service the work items forwarded thereto.

46. (Previously Presented) The method of claim 44, wherein if the state indicating a surplus of work items being predicted is a future risk state, the method further includes predicting when the surplus of work items will occur, and additionally forwarding work items in the work queue to workstations of the second set of resources in dependence on said prediction.

47. (Previously Presented) The method of claim 44, wherein said required queue position ("RQP") is based on a service time goal for each work item and a weighted advance time of the work queue.

48. (Previously Presented) The method of claim 47, wherein said generating step includes:

creating an array of counters, each element in said array of counters corresponding to a predefined range of RQP's; and

incrementing a counter in said array of counters associated with the RQP for each work item; and wherein said determining step includes:

for each work item, subtracting from the service time goal for said work item an amount of time since said work item was received to obtain a remaining time for said work item.

49. (Currently Amended) The method of claim 47, wherein said determining step includes:

determining said weighted advance time of the work queue; and

for each work item, dividing said a remaining time by said weighted advance time for the work queue.

50. (Previously Presented) The method of claim 47, wherein said generating step further comprises:

determining a range of RQP's which correspond to each item within said ordered set, wherein, when a number of a selected item is N, said predefined range of queue positions for the selected item in said ordered set, is  $2^{N-1} < RQP \leq 2^N$ .

51. (Currently Amended) The method of claim 44, wherein said analyzing step comprises:

- creating an index variable;
- setting the index variable to one;
- creating a sum variable;
- setting said sum variable to zero;
- calculating a new sum as the sum of the previous value of the sum variable and the value of the an item in the ordered set which corresponds to the index variable;
- determining the a highest required queue position, RQP, associated with the item in the ordered set which corresponds to the index variable;
- determining if the sum is greater than said highest RQP;
- setting a state to "Future Risk" when said sum is greater than said highest RQP; and
- incrementing said index and repeating said calculating a new sum, determining a highest RQP, determining if the sum is greater than the highest RQP, and setting a state steps when said sum is not greater than said highest RQP.

52. (Previously Presented) The method of claim 51 wherein said analyzing step further comprises:

- determining if there are additional items in said ordered set;
- setting a state to "On Target" when there are no additional items in said ordered set; and
- when said sum is greater than said highest RQP, predicting a time and/or extent of said "Future Risk".

53. (Currently Amended) The method of claim 52 wherein said time is calculated as the product of the index and the weighted advance time for the work queue and wherein said extent is calculated as the a difference between said sum and said highest RQP.

54. (Previously Presented) A computer-readable medium containing processor executable instructions for performing the method of claim 44.

55. (Previously Presented) A contact center, comprising:  
at least one work queue of a plurality of work items from a plurality of customers;  
a plurality of workstations corresponding to a first set of resources;  
a workload monitoring agent operable to:  
generate, based at least in part on said work queue, an ordered set of items related to the plurality of work items in the work queue;  
analyze said ordered set, wherein the analyzing step determines a required queue position for each of the plurality of work items, wherein at least one of the following is true for a selected required queue positions;  
(i) multiple of the work items have a determined required queue position equal to the selected required queue position; and  
(ii) no work items have a determined required queue position equal to the selected required queue position and wherein the selected required queue position is closer to a head of the ordered set than another selected required queue position that equals a determined required queue position of at least one of the work items;  
determine a state of said work queue based on said analysis;  
cause the work items in the work queue to be forwarded to workstations of the first set of resources; and  
when the state corresponds to a predicted surplus of work items, additionally cause work items to be forwarded to workstations of a second set of resources.

56. (Previously Presented) The contact center of claim 55, wherein each of said work items has an associated service time goal, said workload monitoring agent being further adapted to:  
(a) monitor said at least one queue of work items;  
(b) assess a state of said at least one queue of work items with respect to the service time goals for said plurality of work items;

(c) determine a number of work items which are likely not to meet their service time goals and a time at which the service time goal for said number of work items will expire; and

(d) in response to determining a number of work items are likely not to meet their service time goals, assign at least one resource from the second set of resources to at least one of said work items.

57. (Previously Presented) The contact center of claim 55, wherein the workload monitoring agent is further operable to (i) identify a weighted advance time for servicing of work items, (ii) determine a required queue position for each of said work items, (iii) determine said required queue position based on the weighted advance time for servicing of work items, an elapsed time since the work item was received at said at least one queue, and a service time goal for the work items, and (iv) determine, from the at least one queue, a representation of required queue positions associated with the work items in said at least one queue.

58. (Currently Amended) The contact center of claim 55, wherein said required queue position is calculated as  $\frac{\text{the difference between the service time goal and the elapsed time}}{\text{the weighted advance time for servicing of work items}}$ .

59. (Currently Amended) The contact center of claim 55, wherein a predetermined workload level exists when a queue position in  $\frac{\text{the representation of required queue positions}}{\text{the number of enqueued work items ahead of the queue position in the representation of required queue positions}}$  is less than a number of enqueued work items ahead of the queue position in the representation of required queue positions, wherein  $\frac{\text{the time at which the predetermined workload level will likely exist}}{\text{the product of the weighted advance time for servicing of work items and queue position at which the predetermined workload level will likely exist}}$  is the  $\frac{\text{the difference between the required queue position and the number of enqueued work items before the required queue position}}{\text{the weighted advance time for servicing of work items}}$ .

60. (Previously Presented) The contact center of claim 55, wherein the workstations of the first set of resources service the work items forwarded thereto and the workstations of the second set of resources service the work items forwarded thereto.

61. (Currently Amended) A method, comprising:

receiving ~~the~~ a plurality of work items at at least one telecommunications component of ~~the~~ a contact center from a plurality of customers, wherein the at least one telecommunications component comprises at least one of a PBX and a server;

assigning the work items to at least one work queue serviced by a first set of resources;

generating, in a server executing a workload monitoring agent, based at least in part on said work queue, an ordered set of items related to the plurality of work items in the work queue;

analyzing, by said server executing the workload monitoring agent, said ordered set, wherein the analyzing step determines a required queue position for each of the plurality of work items, wherein at least one of the following is true for a selected required queue positions;

(i) multiple of the work items have a determined required queue position equal to the selected required queue position; and

(ii) no work items have a determined required queue position equal to the selected required queue position and wherein the selected required queue position is closer to a head of the ordered set than another selected required queue position that equals a determined required queue position of at least one of the work items; and

based on said analyzing step, assigning the work items in the work queue to the first set of resources.

62. (Previously Presented) The method of claim 61, further comprising:

determining in said workload monitoring agent a state of said work queue; and

when the work queue state is a surplus of work items, additionally forwarding work items to a second set of resources.

63. (Previously Presented) The method of claim 61, wherein (i) is true.

64. (Previously Presented) The method of claim 61, wherein (ii) is true.

65. (Previously Presented) The method of claim 62, wherein the first set of resources service the work items forwarded thereto and the second set of resources service the work items forwarded thereto.

66. (Currently Amended) The method of claim 61, further comprising:  
determining in said workload monitoring agent a state of said work queue; and  
wherein if the work queue state predicts a surplus of work items and is a future risk state, the method further includes predicting when the surplus of work items will occur, and additionally forwarding work items in the work queue to the a second set of resources in dependence on said prediction.

67. (Previously Presented) The method of claim 61, wherein said required queue position ("RQP") is based on a service time goal for each work item and an estimated wait time of the work queue.

68. (Currently Amended) The method of claim ~~64~~67, wherein said generating step includes:

creating an array of counters, each element in said array of counters corresponding to a predefined range of RQP's; and

incrementing a counter in said array of counters associated with the RQP for each work item; and wherein said determining step includes:

for each work item, subtracting from the service time goal for said work item an amount of time since said work item was received to obtain a remaining time for said work item.

69. (Currently Amended) The method of claim 67, wherein said determining step includes:

determining said a weighted advance time of the work queue; and

for each work item, dividing said a remaining time by said weighted advance time for the work queue.

70. (Currently Amended) The method of claim ~~64~~68, wherein said generating step further comprises:

determining a range of RQP's which correspond to each item within said ordered set, wherein, when a number of a selected item is N, said predefined range of queue positions for the selected item in said ordered set, is  $2^{N-1} < \text{RQP} \leq 2^N$ .

71. (Currently Amended) The method of claim 61, wherein said analyzing step comprises:

- creating an index variable;
- setting the index variable to one;
- creating a sum variable;
- setting said sum variable to zero;

calculating a new sum as the sum of the previous value of the sum variable and the value of the item in the ordered set which corresponds to the index variable;

determining ~~the~~a highest required queue position, RQP, associated with the item in the ordered set which corresponds to the index variable;

- determining if the sum is greater than said highest RQP;
- setting a state to "Future Risk" when said sum is greater than said highest RQP; and
- incrementing said index and repeating said calculating a new sum, determining a highest RQP, determining if the sum is greater than the highest RQP, and setting a state steps when said sum is not greater than said highest RQP.

72. (Previously Presented) The method of claim 71, wherein said analyzing step further comprises:

- determining if there are additional items in said ordered set;
- setting a state to "On Target" when there are no additional items in said ordered set; and
- when said sum is greater than said highest RQP, predicting a time and/or extent of said "Future Risk".



73. (Previously Presented) The method of claim 72 wherein said time is calculated as the product of the index and the weighted advance time for the work queue and wherein said extent is calculated as the difference between said sum and said highest RQP.

74. (Previously Presented) A computer-readable medium containing processor executable instructions for performing the method of claim 61.

75. (Previously Presented) A contact center, comprising:  
at least one work queue of a plurality of work items from a plurality of customers;  
a first set of resources;  
a workload monitoring agent operable to:  
generate, based at least in part on said work queue, an ordered set of items related to the plurality of work items in the work queue;  
analyze said ordered set, wherein the analyzing step determines a required queue position for each of the plurality of work items, wherein at least one of the following is true for a selected required queue positions;  
(i) multiple of the work items have a determined required queue position equal to the selected required queue position; and  
(ii) no work items have a determined required queue position equal to the selected required queue position and wherein the selected required queue position is closer to a head of the work queue than another selected required queue position that equals a determined required queue position of at least one of the work items; and  
based on the required queue positions, assign the work items in the work queue to be forwarded to the first set of resources.

76. (Previously Presented) The contact center of claim 75, wherein each of said work items has an associated service time goal, said workload monitoring agent being further adapted to:

- (a) monitor said at least one queue of work items;
- (b) assess a state of said at least one queue of work items with respect to the service time goals for said plurality of work items;

(c) determine a number of work items which are likely not to meet their service time goals and a time at which the service time goal for said number of work items will expire; and

(d) in response to determining a number of work items are likely not to meet their service time goals, assign at least one resource from the second set of resources to at least one of said work items.

77. (Previously Presented) The contact center of claim 75, wherein the workload monitoring agent is further operable to (i) identify a weighted advance time for servicing of work items, (ii) determine a required queue position for each of said work items, (iii) determine said required queue position based on the weighted advance time for servicing of work items, an elapsed time since the work item was received at said at least one queue, and a service time goal for the work items, and (iv) determine, from the at least one queue, a representation of required queue positions associated with the work items in said at least one queue.

78. (Currently Amended) The contact center of claim 75, wherein said required queue position is calculated as the difference between the service time goal and the elapsed time divided by the a weighted advance time for servicing of work items.

79. (Currently Amended) The contact center of claim 75, wherein a predetermined workload level exists when a queue position in the a representation of required queue positions is less than a number of enqueued work items ahead of the queue position in the representation of required queue positions, wherein the time at which the predetermined workload level will likely exist is the product of the a weighted advance time for servicing of work items and queue position at which the predetermined workload level will likely exist; and wherein the number of work items required to be serviced is the difference between the required queue position and the number of enqueued work items before the required queue position.

80. (Previously Presented) The contact center of claim 75, wherein the workload monitoring agent determines a state of said work queue based on said analysis; and wherein the first set of resources services the work items forwarded thereto and the second set of resources services the work items forwarded thereto.

81. (Previously Presented) The contact center of claim 75, wherein (i) is true.
82. (Previously Presented) The contact center of claim 75, wherein (ii) is true.
83. (Previously Presented) The contact center of claim 75, wherein each required queue position  $N$  corresponds to a range of work queue positions and wherein the work queue positions range from  $2^{N-1}$  to  $2^N$ .
84. (Previously Presented) The contact center of claim 75, wherein each required queue position corresponds to multiple positions in the work queue.
85. (Previously Presented) The method of claim 61, wherein each required queue position  $N$  corresponds to a range of work queue positions and wherein the work queue positions range from  $2^{N-1}$  to  $2^N$ .
86. (Previously Presented) The method of claim 61, wherein each required queue position corresponds to multiple positions in the work queue.